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(54) **VULCANIZED SHOE COMPONENT WITH
FIBROUS REINFORCEMENT**

(57)

ABSTRACT

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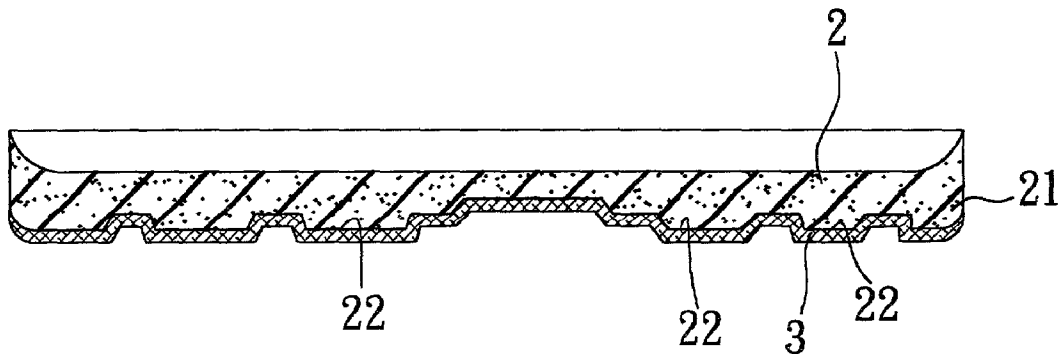
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A shoe component for a shoe includes a composite part which has a vulcanized rubber matrix and a woven fabric sheet bonded integrally to the surface of the rubber matrix during the vulcanization of the rubber matrix. In an embodiment, the composite part is shaped as an outsole, and the surface of the rubber matrix is formed with a tread surface. The fabric sheet includes warp and weft yarns, and pores having a size smaller than 1 mm² so as to limit the amount of the material of the rubber matrix which penetrates through the pores and covers the fabric sheet during vulcanization. A large part of the fabric sheet uncovered at the surface of the rubber matrix can provide the surface of the rubber matrix with a woven texture and different tones of colors.



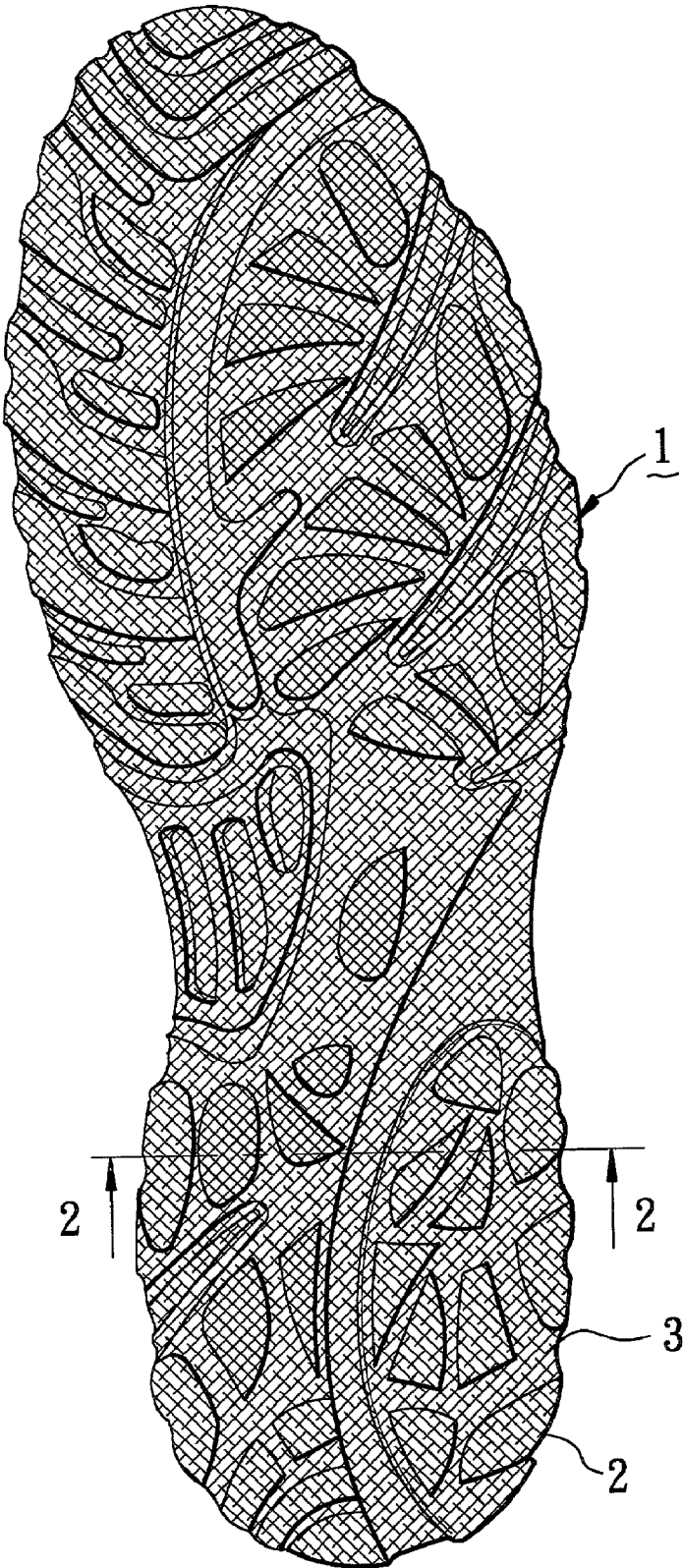


FIG. 1

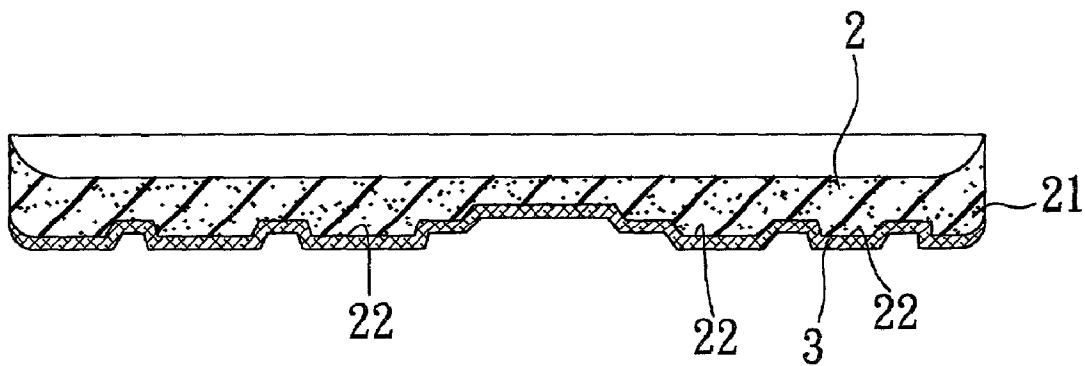


FIG. 2

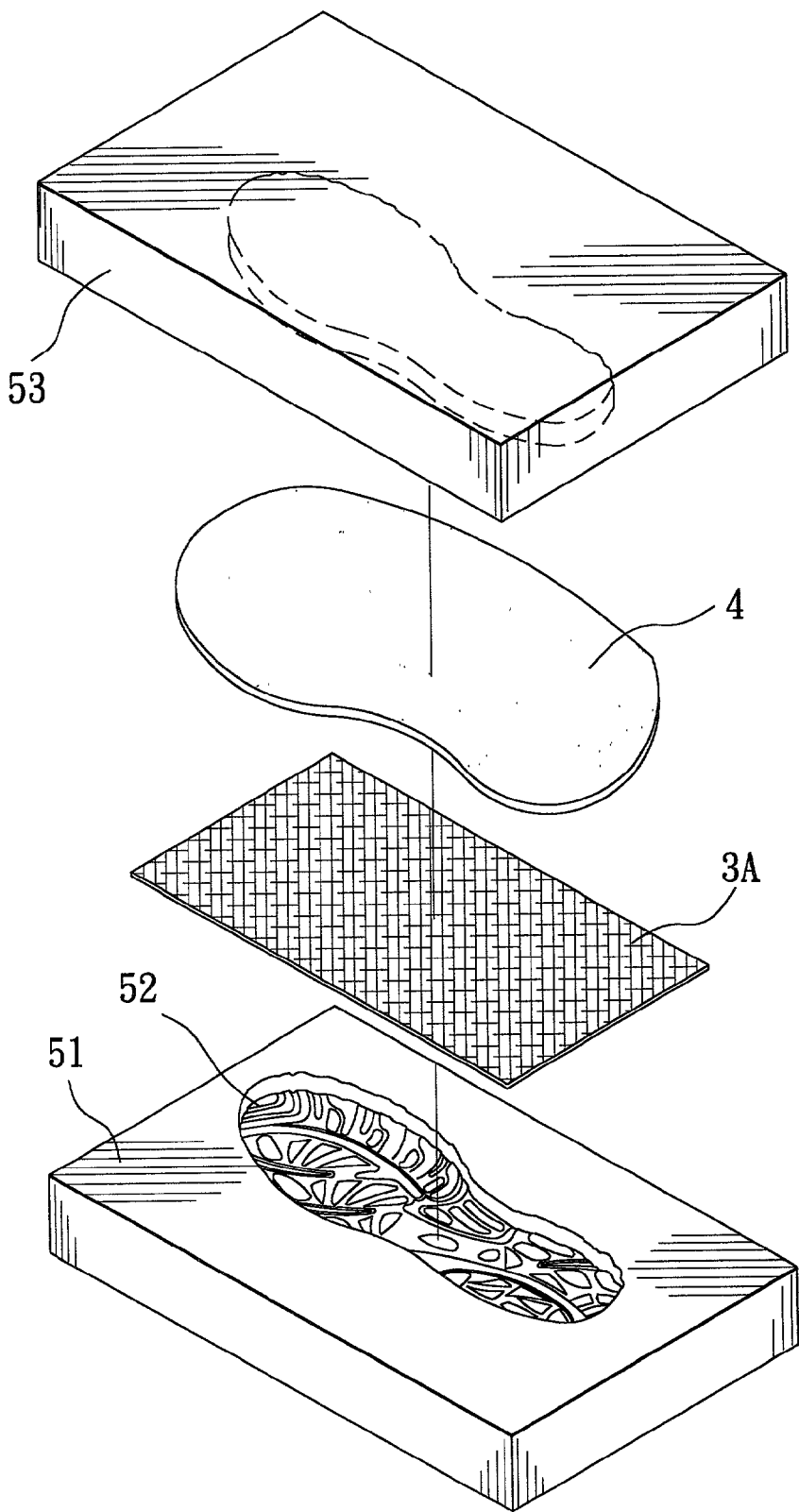


FIG. 3

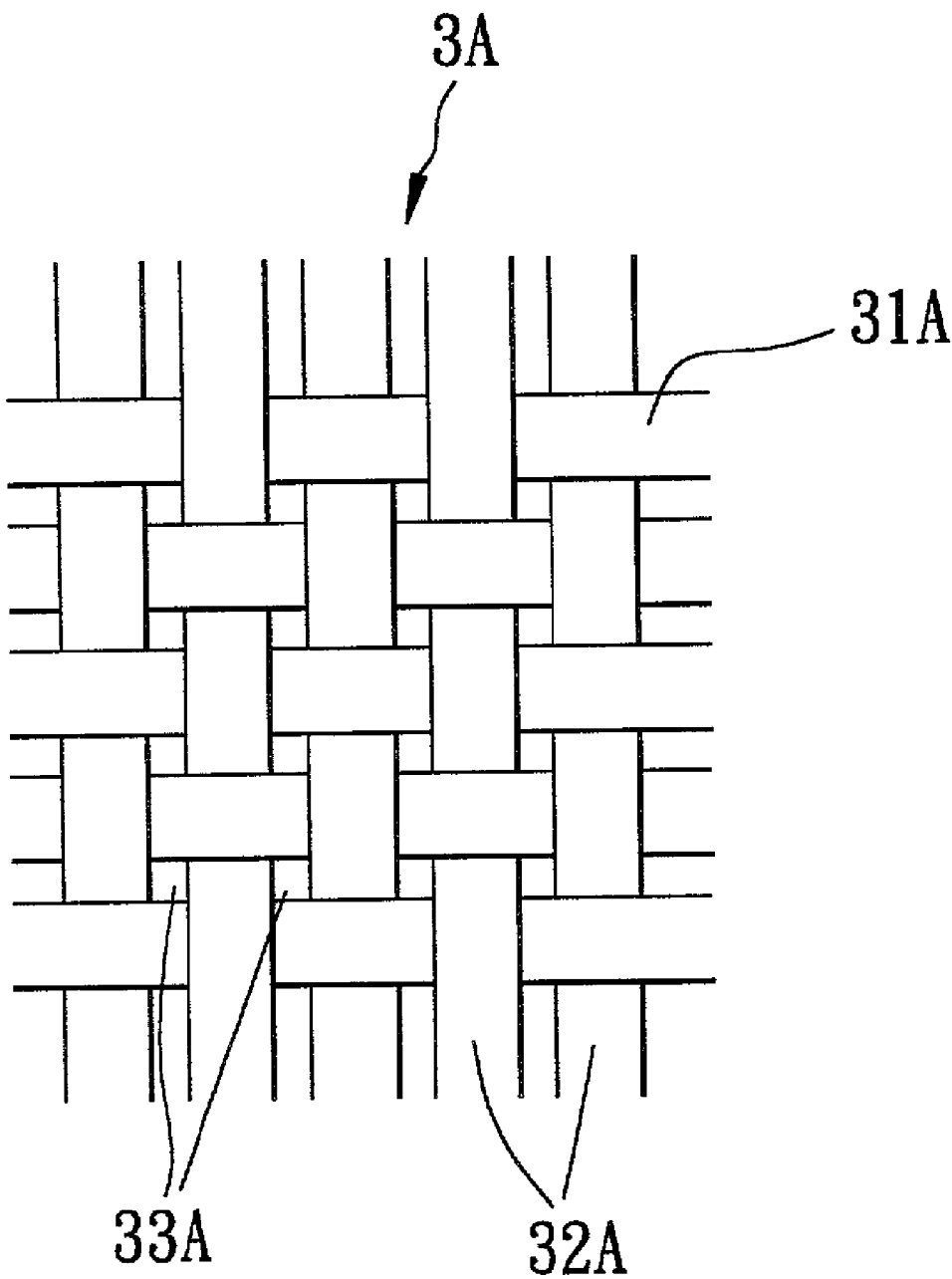


FIG. 4

VULCANIZED SHOE COMPONENT WITH FIBROUS REINFORCEMENT

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The invention relates to a shoe, more particularly to a shoe component, such as an upper or a sole, which is made of a vulcanizable rubbery sheet material incorporating a woven fabric.

[0003] 2. Description of the Related Art

[0004] It is known in the art to fabricate a shoe from raw natural rubber sheets, i.e. unvulcanized raw rubber sheets which can be tailored to form blanks usable for making shoe parts, such as outsoles and uppers. Such blanks can be assembled together and vulcanized in a mold to form a finished shoe component. The raw rubber sheets usually incorporate compounding agents or additives suitable for improving mechanical and physical properties of the final molded products. Particularly, raw rubber sheets for making outsole plates usually incorporate additives, which can impart good durability, wear-resistance and anti-slip characteristics. Depending on the compounding agents or additives incorporated into the raw rubber sheets, the outsole plates are designed with different performance grades for their specific purposes. Generally, outsole plates with high performance grades suitable for outdoor activities, such as hunting, mountain climbing, fishing, etc., require special compounding agents or additives that can increase the cost of manufacturing the outsole plates.

[0005] Aside from natural rubber, common materials available for producing outsoles are injection moldable resins, such as polyurethane, polyvinyl chloride, Ethylvinyl acetate polymers, etc. Such materials are insufficient to present mechanical and/or physical properties required for high performance applications.

[0006] Reinforcement of a shoe sole by using reinforcing fibers has been suggested in the prior art. For example, U.S. Pat. No. 5,406,723 discloses a light and strong cycling shoe sole, which includes a core surrounded by fibrous layers and which is produced from prepreg sheets containing carbon or glass fibers. The shoe sole produced as such is hard and cannot provide good shock-absorbing and anti-slip properties.

SUMMARY OF THE INVENTION

[0007] An object of the present invention is to provide an outsole which is fabricated from a vulcanizable rubbery material without using special expensive additives and which still possesses good mechanical and physical properties required for high performance shoes, such as high durability, high wear-resistance and good anti-slip properties.

[0008] Another object of the present invention is to provide a vulcanized rubbery outsole having a tread surface patterned with a woven texture to improve the appearance of the outsole.

[0009] Accordingly, a shoe component comprises a composite part which includes a vulcanized rubber matrix having a surface adapted to face an exterior side of the shoe, and a woven fabric sheet overlying and integrally connected to

the surface of the rubber matrix via a bonding between the rubber matrix and the woven fabric sheet, the bonding being produced upon vulcanization of the rubber matrix under heat and pressure, the fabric sheet including warp and weft yarns and pores formed among the warp and weft yarns, the pores having a size smaller than 1 mm², the fabric sheet imparting a woven texture to the surface of the rubber matrix.

[0010] Preferably, the composite part is shaped as an outsole, and the surface of the rubber matrix is formed with a tread surface which incorporates the woven texture.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Other features and advantages of the present invention will become apparent in the following detailed description of the preferred embodiment with reference to the accompanying drawings, of which:

[0012] FIG. 1 is a plan view of an outsole embodying the present invention;

[0013] FIG. 2 is a cross-sectional view taken along line 2-2 of FIG. 1;

[0014] FIG. 3 is a perspective view illustrating the fabrication of the outsole of FIG. 1; and

[0015] FIG. 4 is a schematic view showing a portion of a fabric sheet used in the outsole of FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0016] The present invention contemplates to provide a shoe component, such as an upper or an outsole, by using a vulcanizable rubbery sheet material, such as a raw natural rubber sheet, and a woven fabric sheet material. A vulcanized composite part is formed after the rubbery sheet material is vulcanized together with the woven fabric sheet material.

[0017] FIGS. 1 and 2 show a vulcanized composite part or a composite outsole 1 which embodies the present invention. The composite outsole 1 includes a rubber matrix 2, a tread surface 21 formed at one side of the rubber matrix 2, and a woven fabric sheet 3 which is bonded to the rubber matrix 2 and exposed at the tread surface 21 of the rubber matrix 2. The woven fabric sheet 3 presents a woven texture on the tread surface 21 of the outsole 1.

[0018] As shown in FIG. 3, the composite outsole 1 is fabricated by placing the woven fabric sheet material 3A in a cavity 52 of a female mold 51, followed by laying a vulcanizable rubbery sheet material 4 on top of the fabric sheet material 3A. After a male mold 53 is pressed against the female mold 51 and after the male and female molds 53 and 51 are heated for vulcanization, the rubbery sheet material 4 is fused and forced to penetrate through the pores (not shown in FIG. 3) present in the woven fabric sheet material 3A so that the woven fabric sheet material 3A is bonded effectively to the rubbery sheet material 4. The excess portion of the fabric sheet material 3A is finally cut out. Since the fabric sheet material 3A is in contact with an embossing face of the mold cavity 52, when the rubbery sheet material 4 is embossed to form the tread surface 21, the tread surface 21 is imparted with a woven texture of the fabric sheet material 3A.

[0019] The woven fabric sheet material **3A** is made of a textile material. The textile material is preferably a nylon fiber, a polyester fiber, or a mixture of nylon and polyester fibers. As shown in **FIG. 4**, the woven fabric sheet material **3A** includes warp and weft threads **31A**, **32A**. The size of pores **33A** formed among the warp and weft threads **31A**, **32A** is arranged to be smaller than 1 mm^2 , preferably, less than 0.5 mm^2 , so as to limit the amount of the vulcanizable rubbery sheet material **4** penetrating through the pores **33A** due to the pressure applied during the vulcanization process. As such, the most part of the fabric sheet **3** is uncovered at the tread surface **21** of the rubber matrix **2** after vulcanization, and the texture of the fabric sheet **3** can be displayed effectively at the tread surface **21**. Since the fabric sheet **3** may be provided with a color contrasting with the color of the rubber matrix **2**, the tread surface **21** can have different tones of colors. The composite outsole **1** can therefore have an improved appearance as compared to the conventional rubber outsole whose appearance is usually monotonous.

[0020] If the size of the pores **33A** is too large, a large amount of the vulcanizable rubbery sheet material **4** can flow through the pores **33A** due to the pressure applied during the vulcanizing process and can cover the fabric sheet material **3A**. As a result, a large part of the woven fabric sheet **3** will be concealed by the rubber matrix **2** after vulcanization.

[0021] Due to the incorporation of the woven fabric sheet **3**, the composite outsole **1** can exhibit high durability, high wear-resistance and good anti-slip properties. The aforesaid properties are attributable to the woven fabric sheet **3** which functions to enhance the properties of the rubbery sheet material **4** made of natural rubber. The woven fabric sheet **3** can provide excellent anti-slip properties especially when the outsole **1** is used in a wet environment.

[0022] In addition to the aforesaid outsole **1**, the composite part according to the present invention may be configured as an upper. For making an upper, the vulcanizable rubbery sheet material may be tailored to form a plurality of parts which can be assembled together to form an upper in a conventional manner. The woven fabric sheet material is also tailored and incorporated into the tailored parts of the rubbery sheet material during the vulcanization of the rubbery sheet material in a mold. Note that each piece of the

woven fabric sheet material should be disposed at an outer side of a corresponding one of the tailored parts of the rubbery sheet material so that the woven texture of the woven fabric sheet material can be exposed at the outer surface of the composite upper formed after vulcanization.

[0023] While the present invention has been described in connection with what is considered the most practical and preferred embodiment, it is understood that this invention is not limited to the disclosed embodiment but is intended to cover various arrangements included within the spirit and scope of the broadest interpretation so as to encompass all such modifications and equivalent arrangements.

I claim:

1. A shoe component for a shoe, comprising:

a composite part including a vulcanized rubber matrix which has a surface adapted to face an exterior side of the shoe; and

a woven fabric sheet integrally overlying and connected to said surface of said rubber matrix via a bonding between said rubber matrix and said woven fabric sheet, said bonding being produced upon vulcanization of said rubber matrix under heat and pressure, said fabric sheet including warp and weft yarns and pores formed among said warp and weft yarns, said pores having a size smaller than 1 mm^2 , said fabric sheet imparting a woven texture to said surface of said rubber matrix.

2. The shoe component as claimed in claim 1, wherein said composite part is shaped as an outsole, said surface of said rubber matrix being formed with a tread surface.

3. The shoe component as claimed in claim 1, wherein said composite part is fabricated by laying a vulcanizable rubbery sheet material on top of a woven fabric sheet material and by vulcanizing and pressing said vulcanizable rubbery sheet material against said woven fabric sheet material.

4. The shoe component as claimed in claim 1, wherein said woven fabric sheet material is made from a material selected from a nylon fiber, a polyester fiber, and a mixture of nylon and polyester fibers.

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